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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,512	04/01/2004	George L. Kerber	20-010-DIV	6471

23400 7590 01/11/2006

POSZ LAW GROUP, PLC
12040 SOUTH LAKES DRIVE
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EXAMINER

RICHARDS, N DREW

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 01/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/814,512

Applicant(s)

KERBER, GEORGE L.

Examiner

N. Drew Richards

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-22 and 24-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27 is/are allowed.
- 6) ☒ Claim(s) 18-22, 24, 25 and 28 is/are rejected.
- 7) ☒ Claim(s) 26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. The indicated allowability of claims 18-22, 24, 25 and 28 is withdrawn in view of the newly applied references below. Rejections based on the newly applied reference(s) follow.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 18, 19, 22 and 24, 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morohashi et al. ("Self-aligned Contact Process for Nb/AlO_x/Nb Josephson Junctions," Appl. Phys. Lett. 48(3), 20 January 1986, pp 254-256) in view of Lee et al. ("RHEA Process for Fine-Geometry Josephson Junction Fabrication," IEEE Transactions on Magnetics, Vo. 27, No. 2, March 1991, pp 3133-3136). These references were previously cited by applicant in an IDS dated 4/1/04.

With regard to claim 18, Morohashi et al. teach a superconductor integrated circuit in figure 1 comprising:

- a base electrode layer;
- a tunnel barrier layer (Al-AIO_x) disposed above the base electrode layer;
- a counter electrode layer disposed above the tunnel barrier layer; and

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- an anodization ring disposed around a perimeter of the counter electrode layer and a perimeter of the tunnel barrier layer for preventing a short-circuit between an outside contact and the base electrode layer;
- wherein:
 - a tunnel junction region is defined by the counter electrode layer, the tunnel barrier layer and the base electrode layer, the tunnel junction region including a junction contact defined by a top surface of the counter electrode; and
 - the anodization ring includes an anodized portion of the counter electrode layer, an anodized portion of the tunnel barrier layer and an anodized portion of the base electrode layer (since the sidewalls of the counter electrode and tunnel barrier layer are exposed during the anodization process a portion of these layers is necessarily anodized with the top surface of the base electrode layer).

Morohashi et al. do not teach the junction contact having a diameter of approximately 1.00 micron or less.

Lee et al. teach a superconductor Josephson junction integrated circuit device based upon a Nb counter electrode, an Al-AlO_x barrier layer, and a Nb base electrode. Lee et al. teach in the introduction paragraph and in page 3135, second column, first paragraph forming the junctions to a diameter of approximately 1.00 micron or less. At the time of the invention it would have been obvious to form the junction contact in the device of Morohashi to a diameter of approximately 1.00 micron or less. The motivation

for doing so is to improve circuit integration, reducing junction capacitance, and improving speed/frequency performance. Thus, it would have been obvious to combine Morohashi et al. with Lee et al. to obtain the invention of claim 18.

With regard to claim 19, Morohashi et al. further teach the base electrode includes an electrode isolation region (insulation layer) disposed approximately 0.8 micron or less in horizontal distance from the junction contact for providing device isolation.

With regard to claim 22, the counter electrode layer of Morohashi et al. is disposed solely within the anodization ring.

With regard to claim 24, the tunnel barrier layer of Morohashi et al. is disposed solely within the anodization ring.

With regard to claim 25, Morohashi et al. further teach that the base electrode layer and counter electrode layer are comprised of niobium, the tunnel barrier layer is comprised of a layer of aluminum and a layer of Al_2O_3 (though the layer is only explicitly disclosed as AlO_x it is understood that the layer is Al_2O_3 as claimed as a necessary result of the thermal oxidation and native oxide of the Al layer), and the anodization ring is comprised of Al_2O_3 and Nb_2O_3 (these oxides are the necessary result of the anodization step).

With regard to claim 28, Morohashi et al. with Lee et al. teach all the limitations of this claim in a manner similar to that of claim 18 above. Note that Morohashi et al. further teach the counter electrode being above an unexposed portion of the tunnel

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barrier layer and an exposed portion of the tunnel barrier layer (sidewall surfaces) is part of the anodization layer.

4. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morohashi et al. with Lee et al. as applied to the claims above, and further in view of Kerber et al. '084.

a. Morohashi et al. with Lee et al. further discloses that the junction is processed so that an oxide (insulation layer) is coated there over and patterned to produce an outside contact via (contact hole). Morohahsi et al. with Lee et al. do not depict various conventional portions of the structure, such as how other portions of the lower Nb electrode are subsequently insulated or contacted.

b. Kerber teaches Josephson junctions. See e.g., FIG 1 wherein the Josephson junction includes base electrode 12, tunnel barrier 14, and counter electrode 16. An interconnect layer 24 passes through via holes formed in interlayer dielectric layer 6 to contact both of the Nb electrode layers.

c. It would have been obvious to one of ordinary skill in the art at the time of the invention to have further provided an additional via through the insulating layer covering the Morohashi et al. junction which contacts the lower, base electrode because the base electrode necessarily has to be electrically interconnected to external devices in some manner, and Kerber teaches one conventional way of making electrical interconnections to the lower electrode.

Allowable Subject Matter

5. Claim 26 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. Claim 27 is allowed.

7. The following is a statement of reasons for the indication of allowable subject matter:

With regard to claim 26, the prior art of record fails to teach the combination of limitations in claim 26 or 27 including an associated diameter of the anodized portion of the counter electrode layer being less than an associated diameter of the anodized portion of the tunnel barrier layer and the anodized portion of the base electrode layer.

Response to Arguments

8. All of applicant's arguments filed with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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